Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Unit 3.2 Exam – Part 2 **23 POINTS TOTAL**

AP Biology

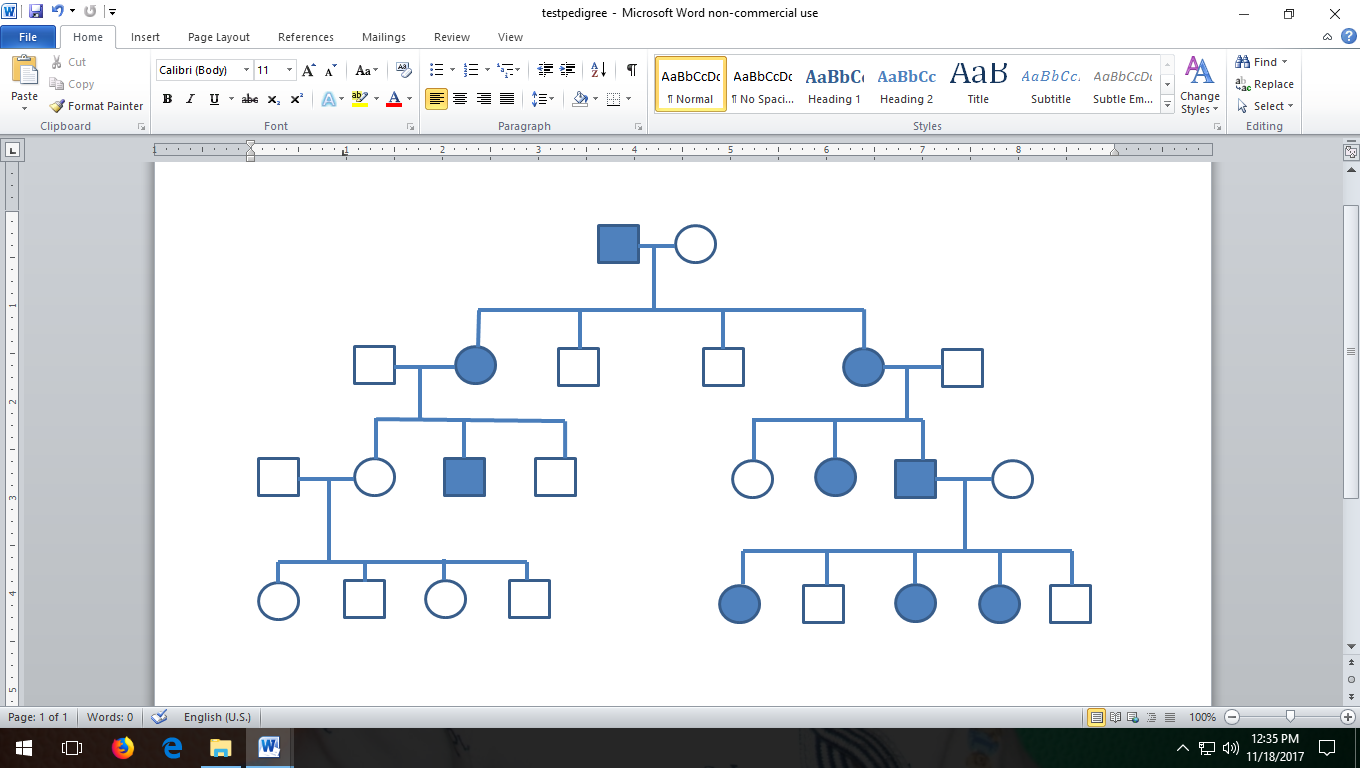
2017 - 2018

This exam will be returned to you so be sure to annotate it while testing so you can understand any misconceptions when it is returned to you for review.

There are 3 Free Response questions

The exam must be completed within the class period

1. The pedigree below models the inheritance of a disorder over 4 generations in a family. Squares represent males and circles represent females and shaded individuals have an affected phenotype. Numbering of individuals goes from left to right in each generation. For example the first shaded female in generation 4 would be identified as IV-5 and the second unshaded male in generation 2 would be identified as II-3.



IV

III

II

I

a. **Predict** the pattern of inheritance modeled in the pedigree above.

**X-LINKED DOMINANT – 2 POINTS AUTOSOMAL RECESSIVE – 1 POINT**

b. **Construct** ONE Punnett square or cross from the pedigree that supports the inheritance pattern you identified in part a. Be sure to identify the individuals from the pedigree in your cross.

**ANY CROSS SHOWING X-DOM PATTERN = 2 POINTS**

**ANY CROSS SHOWING AUT. REC PATTERN = 1 POINT**

c. **Explain** how the results of the Punnett square or cross you constructed in part b support the inheritance pattern.

**RESULTS FOR X-DOM CROSS = 2 POINTS**

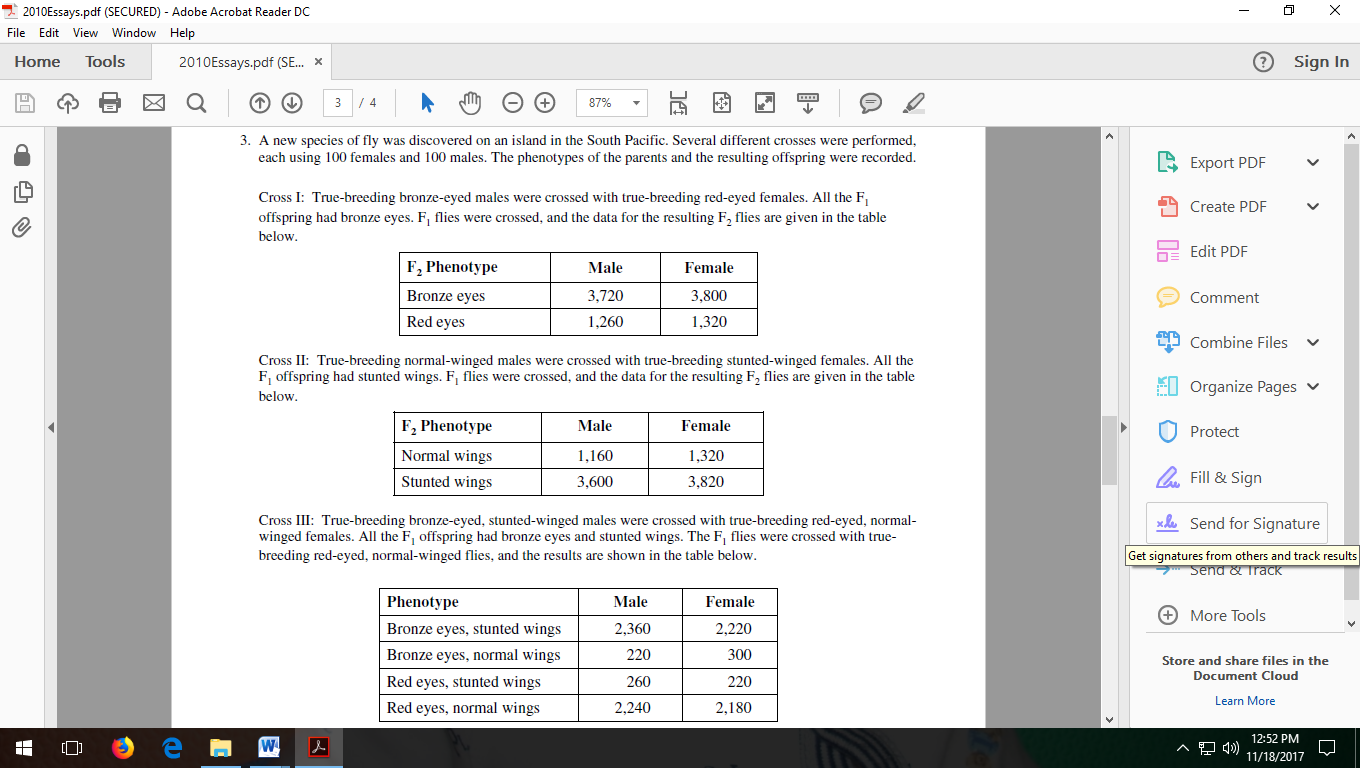
**RESULTS FOR AUT. REC CROSS = 1 POINT**

**SCORING RATIONALE:**

**X-LINKED DOM MORE LIKELY BASED ON TRENDS SEEN IN AFFECTED MALES/FEMALES.**

**AUTOSOMAL RECESSIVE 1/2 CREDIT BECAUSE RESULTS MUCH LESS PROBABLE THAN IF X-LINKED DOMINANT PATTERN.**

2.



1. What conclusions can be drawn from cross I and cross II? **Explain** how the data support your conclusions for each cross.

**BRONZE EYES AUTOSOMAL DOMINANT FOR CROSS 1 – 3/1 RATIO SEEN TYPICAL OF LAW OF DOMINANCE (2 POINTS)**

**STUNTED WINGS AUTOSOMAL DOMINANT FOR CROSS 2 – 3/1 RATIO SEEN TYPICAL OF LAW OF DOMINANCE (2 POINTS)**

1. Write a null hypothesis that can be tested for the data from cross III.

**NO DIFF. IN EXPECTED OUTCOMES V. OBSERVED OUTCOMES FOR TYPICAL DIHYBRID TESTCROSS. (1:1:1:1 RATIO FOR EACH PHENOTYPE) (2 POINTS)**

1. Perform a chi square to test your null hypothesis. **(4 POINTS)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **OBS** | **EXP** | **(O-E)2/E** |
| **BRONZE/STUNTED** | **4580** | **2500** | **1731** |
| **BRONZE/NORMAL** | **520** | **2500** | **1568** |
| **RED/STUNTED** | **480** | **2500** | **1632** |
| **RED/NORMAL** | **4420** | **2500** | **1475** |
| **SUM = 6406** | | | |

1. Use the results from your chi square to accept or reject your null hypothesis.

**CHI SQUARE VALUE OF 6406 IS GREATER THAN CV OF 7.82 SO REJECT Ho MEANING GENES ARE NOT ASSORTING INDEPENDENTLY, MOST LIKELY LINKED ON THE SAME CHROMOSOME.**

**1 POINT**

3. The distances between various genes located on the same chromosome of flies are shown in the table below. Boxes without data are left blank since they would repeat data already present.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Body Color | Wing Length | **Eye Color** | Wing Shape | Leg Length | Wing Angle |
| Body Color | 0 |  |  |  |  |  |
| Wing Length | 18.5 | 0 |  |  |  |  |
| Eye Color | **56 (3)** | **37.5 (4)** | 0 |  |  |  |
| Wing Shape | 35.5 | 54 | **91.5 (1)** | 0 |  |  |
| Leg Length | 17.5 | 36 | **73.5 (2)** | 18 | 0 |  |
| Wing Angle | 27 | 8.5 | **29 (5)** | 62.5 | 44.5 | 0 |

1. Construct a gene map for all six genes shown in the table above.
2. Besides these genes all being linked on the same chromosome, identify ONE reason that could account for any deviations from traditional inheritance patterns.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EYE COLOR** | **WING ANGLE** | **WING LENGTH** | **BODY COLOR** | **LEG LENGTH** | **WING SHAPE** |

**1 POINT FOR EACH CORRECT TRAIT PAIR PLACEMENT = 5 POINTS**

**X-LINKED TRAIT, LETHAL TRAIT, POLYGENIC INHERITANCE – 1 POINT**